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DIFFICULTIES IN MANIFISTATION OF PREDICTIVE THINKING OF PRESCHOOL SENIOR AGE CHILDREN WITH UNDERDEVELOPMENT

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ABSTRACT

The predictive abilities of children are little investigated in cognitive psychology. The results of empirical studies of predictive thinking of senior preschool age children with underdevelopment are presented. The sample group was 6-7 year old children attending kindergarten. There are 18 children with somatic, speech disorders. We used techniques: "Psychodiagnostic complex (PDC)", the method of investigating the peculiarities of predictive activity; the method for diagnostics the level of development of verbal-logical thinking. We used the method of participant observation. We presented the data proving that children with a mental underdevelopment more often make mistakes in predictions and mistakes of distractions, elements alternating, strategies change, classification, which reduces their cognitive efficiency. The results demonstrate statistical relationships between the indicators of the ability to prediction, verbal-logical and visual-creative thinking in children of preschool age. Factors influencing the formation of mental abilities of children are discussed.

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1. INTRODUCTION

Any human activity involves prediction. The development of theoretical and practical aspects of the problem of prediction is not only of relevance importance, but also becomes more popular as it is an important aspect of understanding the functioning of cognitive sphere of a man, his sensory-perceptual and intellect processes. Predictive ability of preschool children is a topic rarely found in cognitive studies. The situation is complicated by the fact that the development of cognitive activity of children takes place in conditions of bad environmental situation, social crises and is influenced by different kinds of sensory systems violations. Замбацявичене, Э. Ф. (1984), says that modern children show a sharp decrease in cognitive development. Смирнова, Е. О., Лаврентьева, Т. В. (2008) states that today's preschool children have a sharp decline in imagination and creativity. Children lose their ability and desire to occupy themselves with something. They make no effort to design new games, to make up tales, to create their own imaginary world. The children of today are the children of display, information culture. These children need psychological and educational support, since most of them have not only complex defects, but also difficulties in behaviour and learning, underdevelopment of intellectual-cognitive sphere. Therefore, the problem of studying the individual peculiarities of cognitive sphere of children in preschool educational institutions becomes extremely important.

A child, learning the world, its surrounding reality, as well as a grown person perceives processes and organizes information. Any cognitive activity has a more or less probabilistic forecasting of future events or readiness to perceive, presetting, anticipation. The process of probabilistic forecasting is one of the mechanisms that ensure speed, accuracy of perception of sensory information, its processing peculiarities, and is associated

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with the frequency of occurrence of particular objects or events in the past of a child. All events in a child's life, are linked and fixed in the memory, thereby forming a probabilistic connection between certain events.

The best known researches by Л. А. Регуш deal with the structure of cognitive predictive ability and describe it as a set of mental qualities that determine the success of solving various types of predictive tasks (K. Reichenbach, K. et al, 2016). Another well-known research was done by L. I. Peresleni and other scholars, who studied the connection of predicting processes with the features of main mental functions (voluntary attention, memory, perception, thinking) (Переслени, Л. И., Мастюкова, Е. М., Чупров, Л. Ф., 1990). An interesting research was carried out by Менделевич, В. Д., Менделевич, Д. М. (2009), who argues that predictive (anticipatory) abilities have personal and situational, spatial and time components and are developed in an advisory and training mode.

2. MATERIALS AND METHODS

The objects of the research were senior preschool children aged from 6 to 7 years. According to the results of the questionnaire children were divided into two groups: a correctional group, or a group of children with delays in mental development (18), and an educational group, the level of mental development of children corresponds to the age norm (33). In the questionnaire the psychologist recorded the results of a child observation and the information provided by the kindergarten teachers. The items under consideration were: the difficulties of behavior and learning; the peculiarities of emotional-volitional sphere and attention; the peculiarities of a child cognitive activity; violations in the motor area; the existing impairments of hearing and vision; reactions, detected during the surveys; attitude to success and failure in the process of task execution; as well as other features of behavior, character, cognitive activity (if there are any). The obtained data allowed to make a more complete portrait of the surveyed preschool child.

The main research methods were: observation, interview, psychological diagnosis. As methodological tools we used psych diagnostic methods included in "Psychodiagnostic complex (PDC)", developed and probed by Переслени, Л. И., Мастюкова, Е. М., Чупров, Л. Ф., (1990). The complex allows to reveal the peculiarities of individual development of cognitive activity of a child: questionnaire, giving information to analyze the condition of the child at the time of the survey, the peculiarities of behavior and cognitive activity. We also used the method of research peculiarities of predictive activity "Ugadaika", developed by Pishchik, V. I., Molokhina, G. A., 2016; the method for diagnostics of development level of verbal-logical thinking, designed by Belousova, A. K., Pishchik, V. I., 2015 based on the verbal subtests of R. Amthauer and modified by Переслени, Л. И., Мастюкова, Е. М., Чупров, Л. Ф., 1990; the method with the use of split pictures, developed by Л. И. Переслени, О.И. Шурановой (Переслени, Л. И., Мастюкова, Е. М., Чупров, Л. Ф., 1990). To determine the significance of differences we used non-parametric U-criterion by Mann-Whitney.

3. RESULTS

The analysis of the thought processes peculiarities of the senior preschool children, conducted on the basis of empirical data showed the following. Indicator I " predictions mistakes" shows the number of mistakes made by the subjects in the predicting process, in order to detect rotation elements of the second and third sets separately. This indicator reflects the child's ability to hold in the memory his predictions, to compare them with the order with the elements and make conclusions about the sequence of letters. Low efficiency of prediction correlates on the one hand with the processes weakness of capturing information, on the other - with the shortcomings of voluntary attention and in particular with bad allocation. Children in correctional group make "predictions" mistakes in the process of forecasting more often than children in educational group (U = 178,500, $P \leq 0{,}05$). It is more difficult for them to hold in memory their predictions, to compare them with the order of the elements and make conclusions about the sequence of letters. According to the results of the research Переслени, Л. И., Мастюкова, Е. М., Чупров, Л. Ф., (1990) low efficiency of the prediction is correlated with the weakness of the processes of capturing information and with the insufficiency of voluntary attention, in particular with bad allocation.

The diagnosis results are presented in Figure 1.

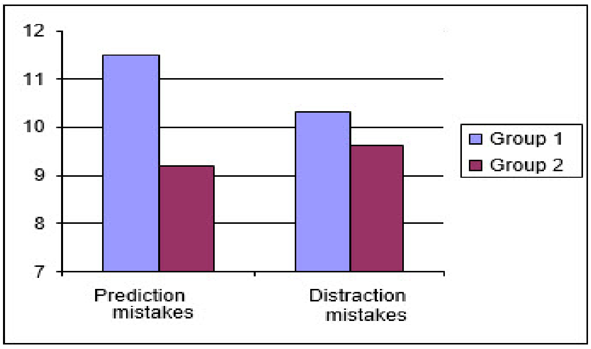

Figure 1. Mistakes of prediction and distraction made in the forecasting process by preschool children

This indicator reflects the level of development of regulation processes affecting the efficiency of predicting activity. These mistakes reflect mainly the stability of voluntary attention. “Distractions” mistakes indicate that even short 10-15 minutes survey, that has a game character, low level of selective attention, adversely affects the efficiency of information processing (Переслени, Л. И., Подобед, В. Л., 1982. p. 10). Mistakes indicator of “distraction” is slightly higher in the children of correctional group than in the educational group. In other words, there is not a significant difference in the level of development of regulation processes, the stability of voluntary attention, influencing the effectiveness of predictive activity in the children groups. However, the presence of “distraction” mistakes reduces the efficiency of information processing (Wu, L. Y., 2016).

Analysis of the indicator “reproduction”, which gives additional information about the features of the long-term memory, due to the state of “read” the information mechanisms and important for effective predictive activities, showed that the children of correctional group worse reproduce the sequence of elements in three sets than the children in educational group (U = 124,500, $\rho \leq 0,05$). In the correctional group, 28% of children reproduced all three sequences of letters, 39 % of children reproduced two sequences, those were mostly the sequences of the first and second sets of letters and 33% of children reproduced one sequence of letters. In the educational group 49 % of children reproduced the three sequences, 42% of children reproduced two sequences and 9 % of children – one sequence of letters. The results are presented in Figure 2.

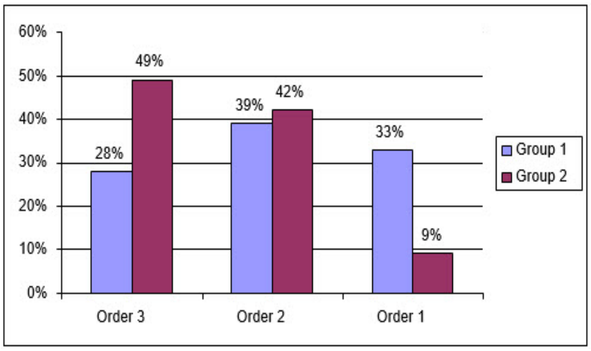

Figure 2. The success of reproduction of elements sequences in the forecasting process of preschool children in percentage

Indicators II and III allow to approach indirect and direct characterization of the efficiency of memorizing and storing information in the register of short-term memory, on the one hand, and reproduction of information that came for storage to the long term memory, on the other hand. The difficulty in reproducing the sequence of earlier correctly predicted elements may indicate a violation of neurophysiological mechanism, which provides directional “reading” of information from memory (Переслени Л. И., Рожкова Л. А., 1990).

The analysis of the strategies that were chosen by the children in educational activities, providing an active perception of the information showed that the correctional group of children is dominated by rational strategies or change strategies, in the educational group of children rational strategies dominate. Rational strategies contribute to the selection of relevant information and the detection of order of receiving various and important signals. They are formed in ontogeny and depend on the level of development of higher mental functions. Children in the correctional group often use the change of strategies or at random predictions, representing a form of ineffective forecasting of cyclic sequences, when the probability to identify quickly the sequence of elements decreases. The least rationally – occasionally predictions of letters, without regard to the right or wrong previous predictions.

The child’s use of rational strategies increases the likelihood of a successful solution of the forecasting task, which is combined with a small number of incorrect predictions. This realizes the possibility of forming generalizations in order to detect the principle of alternation of the elements in the set. In these cases, asymmetric sequence III set is reproduced with fewer incorrect predictions than the symmetric sequence II set.

The result is presented in Figure 3.

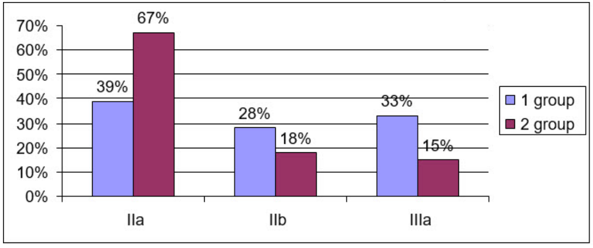

Figure 3. Predictions strategies typical for preschool children in percentage

Change of strategies is one of the forms of inefficient forecasting of cyclic sequences. This decreases the likelihood of rapid identification of the sequence of elements. The least rationally – occasional prediction of letters, without regard to right or wrong in previous predictions.

In the process of research of features of verbal-logical thinking, we have found out that there are differences in the level of development awareness, ability to abstraction, reasoning by analogy, the ability to generalize in children of groups 1 and 2 (Table 1). These differences are reflected in Figure 4.

Table 1. Features of the verbal-logical thinking in children of senior preschool age

Group	The average value, points				
	Awareness	Abstraction	Reasoning by analogy	Generalization	Indicator of success
1	3,7	6,6	3,1	3,6	17,0
2	3,9	7,5	3,8	4,0	19,2
Mann-Whitney Criterion	432,000	295,500	252,500	405,500	273,500
Level of statistical importance	0,312	0,043*	0,035*	0,243	0,039*

* differences are significant at $\rho \leq 0,05$

** differences are significant at $\rho \leq 0,01$

The children of Group 1 have lower values on indicators of verbal-logical thinking than the children in the 2nd group.

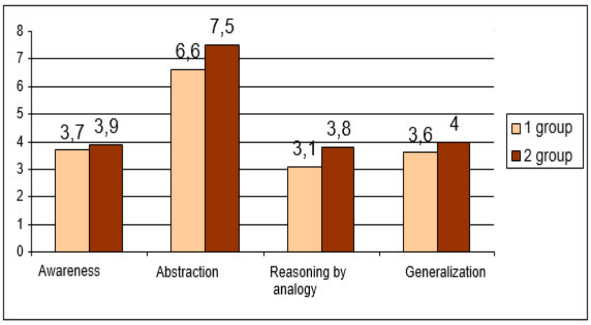

Figure 4. Indicators of verbal-logical thinking in preschool children

In terms of awareness children of both groups, have some difficulties of implementing logical choice based on inductive thinking, the existing stock of knowledge and understanding. There were not significant differences in the groups.

The analysis of formation of logical action (classification), ability to abstraction, has shown that children of the 1st group less successfully distract from occasional and minor signs, from the usual relationship between objects and are able to use this mental technique as classification. Children of Group 2 handle the tasks more successfully. These differences are significant (U = 295,500,$\rho \leq 0,05$).

Children of the 1st group on average worse establish logical connections and relations between objects. The formation of logical action, “reasoning by analogy” is also higher in Group 2. These differences are significant (U = 252,500, $\rho \leq 0,05$).

The indicator of formation of generalizing concepts is above average in both groups of children, in some cases summing up the two concepts under a common category – a generalization, causes the problem. The differences are insignificant.

The indicator of success of solving the four verbal subtests (in percentage) that we calculated on a formula, is higher in Group 2 than in Group 1 where children badly coped with the solution of verbal tasks (Figure 5). Differences are significant (U = 273,500, $\rho \leq 0,05$).

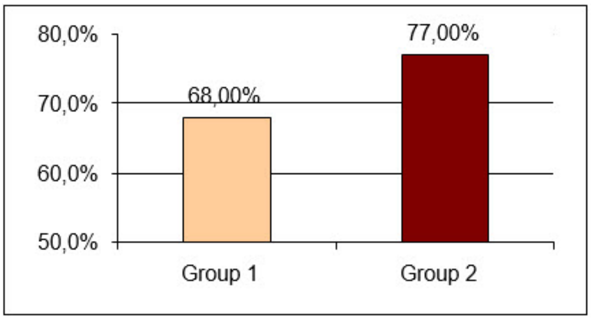

Figure 5. The success indicator of verbal-logical thinking in children of senior preschool age

Thus, the analysis of indicators of the verbal-logical thinking allowed to establish that the overall level of development of verbal-logical thinking is low in Group 1. Children in Group 1 have certain difficulties with verbal tasks, which are based on the ability to abstract, find reasoning by analogy and the ability to generalize, which affects the indicator of success of verbal-logical thinking.

The study of features of visual-creative thinking showed that there are differences in the level of development of visual-figurative thinking of preschool children of Groups 1 and 2 (Table 2). These differences are reflected in Figure 6.

Table 2. Features of visual-figurative thinking in children of senior preschool age

Group	The average value, points		
	Butterfly	**Cock**	**Success level**
1	6,9	8,2	15,1
2	7,8	8,5	16,3
Mann-Whitney Criterion	153,500	260,000	162,000
Level of statistical importance	0,041*	0,452	0,048*

* differences are significant at $\rho \le 0{,}05$
** differences are significant at $\rho \le 0{,}01$

Pictures were shown to the children in ascending orderof difficulty. Collecting the first picture of the “Boy” – was an easy task and we used it to acquaint with the assessment process. As a rule, the children successfully coped with the implementation of this task. Its results did not affect the quantification of the level of development of perceptual operations and visual forms of thinking; therefore, they are not presented in Table 4.

Task № 2 “Butterfly” represents the original picture. In this task, as in the first one, there is a sign of symmetry that facilitates the child’s orientation in the task. On the whole, children in both groups successfully coped with this task, however, the number of children solved the task with the second and third attempts is higher in Group 1. The results are presented in Figure 6.

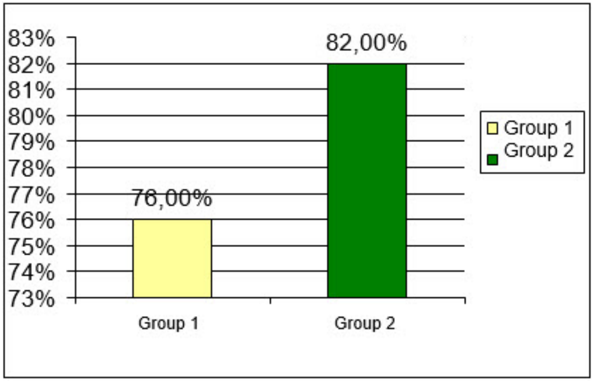

Figure 6. Success level of pictures collecting by preschool children

Task № 3 “Cock” is more complex than the previous two ones. The difficulties of collecting the picture are in the irregularity of its cut lines into pieces, i.e. contrary to the usual division: head, torso, legs etc. Children of both groups quite successfully coped with the implementation of this task. Children who had problems with this task, used the second and the third attempt in the process of pictures collecting and asked for different types of assistance:

1) indicating the mistake of the solution providing the possibility of more attempts (stimulating help);

2) presentation of the image of the whole object, the picture, that needs to be collected;

3) presentation of the image which is cut into parts (dissected sample);

4) picture collecting by overlapping parts on the dissected sample.

On the whole, it should be noted that the level of development of visual-figurative thinking is slightly higher in Group 2 than in Group 1. These differences are significant (U = 162,000, $\rho \le 0{,}05$).

The conducted correlation analysis showed correlations between indicators of the ability to prediction, verbal-logical and visual-figurative thinking in children of preschool age and the results are presented in Table 3.

Table 3. Correlations of indicators of predicting, verbal-logical and visual-figurative thinking in children of preschool age

	Awareness	**Abstracting**	**Reasoning by analogy**	**Generalization**	**Success indicator of verbal-logical thinking**	**Visual-figurative thinking**
Prediction mistakes	-0,423(*)	-0,490(*)	-0,575(**)	-0,425(*)	-0,487(*)	-
Distraction mistakes	-	-	-0,435(*)	-0,442(*)		-
Reproduction	0,395(*)	-	0,586(**)	0,423(*)	0,340(*)	0,401(*)
Visual-figurative thinking	-	-	0,349(*)	-	-	-

** Correlation is significant at the level 0,01
* Correlation is significant at the level 0,05

On the basis of the results, we constructed the correlation Pleiades, allowing to reflect the correlations vividly on the pictures 7, 8, 9, 10.

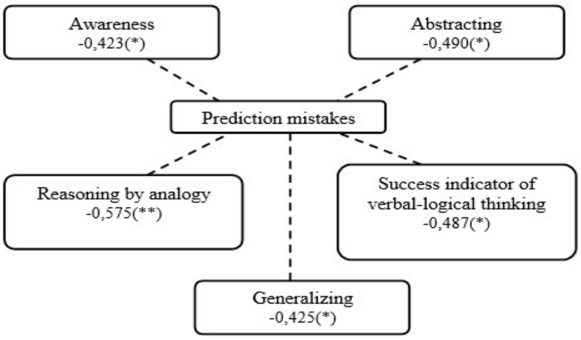

Figure 7. Correlation of prediction mistakes and indicators of verbal-logical thinking in children of preschool age

The indicator of ability to forecast the "prediction mistakes" has a negative correlation with the following indicators of verbal-logical thinking: abstracting (r = - 0,490, when $\rho \leq 0,05$); awareness (r = - 0,423, when $\rho \leq 0,05$); reasoning by analogy (r = - 0,575, when $\rho \leq 0,01$); generalization (r = - 0,425, when $\rho \leq 0,05$); total indicator of success of verbal-logical thinking (r = - 0,487, when $\rho \leq 0,05$).

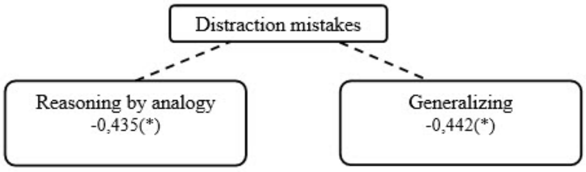

Figure 8. Correlation of mistakes of distraction and indicators of verbal-logical thinking in children of preschool age

The indicator of the ability to prediction of "distractions mistakes" has a negative correlation with the following indicators of verbal-logical thinking: reasoning by analogy (r = - 0,435, when $\rho \leq 0,05$); generalizing (r = - 0,442, $\rho \leq 0,05$).

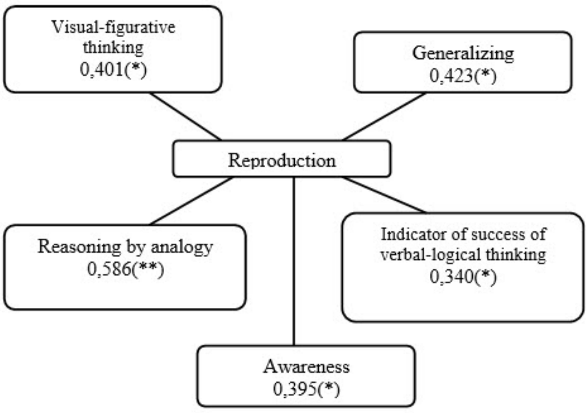

Figure 9. The correlation of reproduction and indicators of thinking in children of preschool age

The indicator of the ability to predict the "reproduction" has a positive correlation with the following indicators of verbal-logical thinking: awareness (r = 0,39, when $\rho \leq 0,05$); reasoning by analogy (r = 0,586, $\rho \leq 0,01$); generalizing (r = 0,423, when $\rho \leq 0,05$); the indicator of success of verbal-logical thinking (r = 0,340, when $\rho \leq 0,05$); visual-figurative thinking (r = 0,401, when $\rho \leq 0,05$).

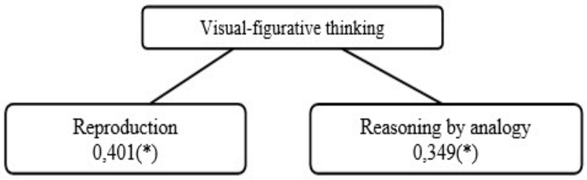

Figure 10. Correlation of visual-figurative thinking, indicators of forecasting and verbal-logical thinking in preschool children

Visual-figurative thinking correlates positively with the indicator of verbal-logical thinking “reasoning by analogy” (r = 0,349, when $\rho \leq 0{,}05$) and the indictor of ability to predict “reproduction” (r = 0,401, when $\rho \leq 0{,}05$).

Thus, the prediction mistakes and distraction mistakes in the forecasting process have a negative correlation with indicators of verbal-logical thinking (awareness, abstraction, reasoning by analogy, generalization). Preschool age children are characterized by the following phenomenon: the lower is the level of verbal-logical thinking; the more is the number of mistakes.

Reproduction the order of three sets elements sequences after their last presentation positively correlates with such indicators of verbal-logical thinking as awareness, reasoning by analogy and generalization, the success indicator of verbal-logical thinking and visual-figurative thinking.

4. DISCUSSION

The difficulty in predicting will slow down the processes of socialization in children. As it is shown in the study of Shiyan, O. A., Kokontseva, E. V. (2014) there is a statistically significant correlation of the child’s ability to use dialectical thinking, and such components of interaction with colleagues as the ability to cooperate and the ability to behave independently. This affects the development of his style of thinking in the future (Belousova, A. K., Pishchik, V. I., 2015).

Numerous studies show that in normal (Passolunghi, M. C. et al, 2015; K. Reichenbach, K. et al, 2016) and abnormal development of a child’s intellectual abilities a great role is played by his level of memory development and nonverbal intelligence (Pishchik, V. I., Molokhina, G. A., 2016; Valencia-Naranjo, N., Robles-Bello, M. A., 2017).

It is also stressed that of great importance for the development of strategic thinking is the inclusion of mental action in a game, drawing, free time activities (Pishchik, V., 2014; Wu, L. Y., 2016).

It is possible to highlight cross-cultural aspect of the problem of forming of cognitive abilities in children of preschool age. Here cultural context is of great importance (Cole, M., 2003; Мацумото Д., 2003). In some cultures, parents suppress cognitive activity of children, in other cultures on the contrary they encourage it (Мацумото Д., 2003; Pishchik, V., 2014).

Thus, preschool children can improve their predictive abilities when the operations of forward-looking thinking will be included in games, educational and free activities in the kindergarten and they will be supported by adults.

5. CONCLUSIONS

The empirical study of peculiarities of mental processes in children of preschool age in the correctional group and in the group with the development corresponding to the age norm leads to the following conclusion:

1. Children of Group 1 (correctional) are characterized by:

- the average efficiency of the prediction and lower level of development of regulation processes affecting the efficiency of predictive activities, make significantly more often predictions mistakes and distraction mistakes in the process of forecasting activity than children of Group 2;

- reproduce worse the sequence of elements in three sets than the children of Group 2;

- in terms of prediction of the letters sequence often use strategies change (form of inefficient forecasting) or random predictions, which is not typical for children of Group 2.

2. In Group 1 the level of development of verbal-logical thinking is lower than in Group 2.

3. In Group1 the level of development of visual-figurative thinking is lower than in Group

4. The conducted correlation analysis showed correlations between indicators of the ability to prediction, verbal-logical and visual-figurative thinking in children of preschool age:

- the prediction mistakes in the forecasting process negatively correlates with indicators of verbal-logical thinking (abstraction, awareness, reasoning by analogy, generalization) and the total success indicator of verbal-logical thinking;

- the distraction mistakes in the forecasting process negatively correlates with indicators of verbal-logical thinking (reasoning by analogy and generalization);

- the reproduction indicator positively correlates with indicators of verbal-logical thinking (awareness, reasoning by analogy, generalization), with the success indicator of verbal-logical thinking and visual-figurative thinking;

- indicators of verbal-logical thinking positively correlates with visual-figurative thinking.

5. Based on the obtained data we proposed the program of development of prediction abilities of preschool age children and gave recommendations to the leadership of the children's educational institution.

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Conflict of interests

Authors declare no conflict of interest.

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